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ABSTRACT

To determine the effects of pencil shape and size on motor accuracy and pencil posture of eight-year-old children, a study randomly assigned 54 third grade school children to one of three experimental conditions: (1) using a standard 2B pencil, (2) using a 1.5 cm thick 2B pencil, and (3) using the standard 2B pencil with the attachment of an "easy-grip." Children were then asked to complete the Southern California Motor Accuracy Test. Subsequently they were asked to write their name, birth date, and address on the test sheet. Performance on the test revealed that pencil shape and size had no influence on the ability of children to perform a motor accuracy test. However, more mature pencil posture was adopted by those children using the thicker pencil and those equipped with an "easy-grip." (HOD)

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EFFECTS OF PENCIL SHAPE AND SIZE ON MOTOR ACCURACY AND PENCIL POSTURE OF 8 YEAR OLD CHILDREN

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ABSTRACT

Fifty-four 8 year old school children were randomly assigned to one of three experimental conditions:

(a) using a standard 2B pencil;

(b) using a 1.5 cm thick 2B pencil; and

(c) using the standard 2B pencil with the attachment of an "Easy-grip".

Performance on the Southern California Motor Accuracy Test revealed no difference between the groups. However the pencil posture adopted by those using the thicker pencil and the "Easy-grip" was shown to be more mature than for the standard pencil.

Controversy exists concerning the use of different types of writing instruments for children in early school grades. Early researchers have felt that the immature grasp of 6 and 7 year olds would benefit from the use of pencils with a shaft thicker than the usual 7mm diameter (Miller 1924, Cavanah and Myer 1937, Hill and Savage 1938). Pencils of approximately 1.5 cm shaft diameter (a similar thickness to a stick of chalk) are available and some teachers recommend their use for children with crude grasp. Wiles (1940), following a study of 800 grade one pupils in which a variety of handwriting instruments were used, concluded that:

> "...there seems little justification for the use by beginners of tools other than those already standardized and recommended for use throughout life."

This view has been supported by Tawney (1967) and Krzesni (1971) who found that differing writing instruments did not effect the quality of handwriting performance. Coles and Goodman (1980) also believed that variety was important in aiding creativity when learning composition. Since handwriting instruction is considered to be of fundamental importance in primary school curricula (Bull and Stevens 1979, Edigar 1980) the issue of how it can be influenced by pencil shape and size deserves further attention.

In addition to the consideration of writing instruments, the development of an appropriate pencil grip in the execution of handwriting has also been stressed. It is generally accepted that the shaft of the pencil rests lightly on the distal interphalangeal joint of the third finger and is balanced between the gently flexed thumb and forefinger, which oppose approximately 1 cm up the shaft of the pencil. This is shown in Figure 1.

(a) angle of flexion of the index finger;

(b) number of fingers on the pencil shaft;

(c) presence of pad to pad opposition between the thumb and index finger; and

(d) degree of supination/pronation of the forearm.

In the author's previous study it was found that whilst children between the ages of 7 and 12 years demonstrated a "dynamic tripod posture", as described by Rosenbloom and Horton (1971), this varied developmentally in certain parameters. The angle of flexion of the index finger decreased with age, while there was an increase in the amount of forearm supination. The remaining two factors, number of fingers on pencil shaft and pad to pad opposition, were randomly distributed.

METHOD

Subjects

Fifty-four children (equal numbers of boys and girls) participated in the study. They were aged between 7 and 8 years and attended the 3rd grade of a middle class Catholic parish school. The mean age for girls was 8.0 and for boys 8.2 years.

Equipment

Eighteen 1.5 cm diameter shaft 2B pencils, thirty-six 7 mm diameter shaft 2B pencils and eighteen "Easy-grip" rubber pencil holders were used. The Southern California Motor Accuracy Test (SCMAT) was also used (Ayres 1972).

Procedure

Girls and boys were randomly assigned separately to one of three conditions in which they used either:

(a) a 1.5 cm diameter shaft 2B pencil;

(b) a 7 mm diameter shaft 2B pencil; or

(c) a 7 mm diameter shaft 2B pencil fitted with an "Easy-grip".

They were then required to complete the SCMAT. Subsequently they were asked to write their name, birth date and address on the test sheet. During this time their pencil posture was rated according to earlier criteria (Ziviani 1981). This involved observing the following components:

(a) Angle of flexion of the index finger - If the proximal interphalangeal (P.I.P.) joint was flexed at 90 degrees or more with or without hyperextension of the distal interphalangeal (I.D.P.) joint, a grade of 1 was given. If the P.I.P. joint was less than 90 degrees flexion, a grade of 2 was assigned.

(b) Forearm supination - If the forearm was determined to be less than 45 degrees supinated, a grade of 1 was given. While if it was between 45 and 90 degrees, a grade of 2 was given.

(c) Opposition - If fingers used by the children were not in pad to pad opposition, a grade of 1 was given. If fingers were opposed, a grade of 2 was given.

(d) Fingers used - Where the child gripped the pencil with the thumb, index finger and radial aspect of the middle finger, a grade of 1 was given. When the pads of all 3 of these fingers rested on the shaft, then a grade of 2 was given.

RESULTS AND DISCUSSION

Motor Accuracy

Analysis of variance revealed no significant difference between motor accuracy scores of boys and girls under the three pencil conditions with an F of 0.05 (F, df = 2, 48, 3.19, p 0.05). This result suggests that pencil thickness or shape has no influence upon the accuracy with which children are able to trace a line. Tracing has been shown to be an effective way of teaching handwriting skills (Birch & Lefford 1967). Therefore this result also suggests that pencil shape does not influence handwriting performance. Along with the work of Wiles (1940), this lends support to the view that children should be allowed to use a variety of instruments when learning to write. Choice should be guided by the individual preference and ease with which writing is achieved.

Pencil Posture

On the other hand pencil shape did influence the pencil posture adopted by children. Table 1 summarises the relationship between the three pencil conditions and components of pencil grip. Results show that two factors were significantly influenced - index finger flexion and forearm supination. These are the same factors which were also shown to exhibit a developmental trend (Ziviani 1981). It therefore appears that the thicker pencil and the use of the "Easy-grip" promote a more mature pencil grip in 8 year old children.

INSERT TABLE 1

It may be that the wider shaft discourages the pressure exhibited in young writers who hyperextend the D.I.P. of the index finger. This may result in a more even quality of line and distribution of writing pressure. However further investigations would be required to verify this postulate. The implications for transferring to the standard pencil after using the thicker one in early grades is complex.

It could be that having learnt to use the thicker pencil children may find the standard pencil more difficult, needing to slightly modify their motor schema. On the other hand having had the opportunity to develop a more mature pencil grip with the thicker pencil this may ultimately transfer to other instruments and facilitate writing. Certainly the development of even pressure and tension may reduce the incidence of writer's cramp.

The appearance of greater forearm supination in children using the thicker pencil and "Easy-grip" may also be related to relaxation of pressure in the grip. Without the need to apply as much downward force the horizontal movements across the page are able to become more fluid.

The remaining components - opposition and fingers used, did not show any change over the conditions and are probably more a reflection of lack of teacher correction and poor habit formation. Researchers have also found that children with neurological impairments demonstrate "bizarre" pencil grip (Anderson 1975). It would be of interest to further examine the children with poor grips to determine if minor neurological signs are present and possibly contributing to poor fine motor control.

In summary then, pencil shape and size was shown to have no influence on the ability of children to perform a motor accuracy task. However more mature pencil posture was adopted by those children using the thicker pencil and those equipped with an "Easy-grip".

Fig. 1 Generally accepted pencil posture for writing.

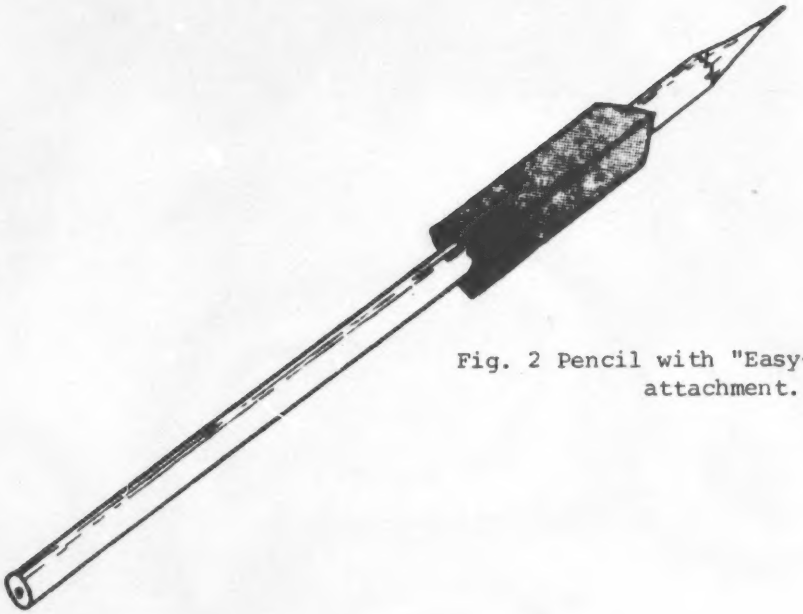

Fig. 2 Pencil with "Easy-Grip" attachment.

TABLE 1. Components of Pencil Posture compared over Three Pencil Conditions

	Thin		Thick		"Easy-grip"		χ^2
Grade	1	2	1	2	1	2	
Index Finger	2	16	10	8	14	4	16.48**
Grade	1	2	1	2	1	2	
Forearm	7	11	0	18	7	11	26.32**
Grade	1	2	1	2	1	2	
Opposition	16	2	18	0	16	2	2.3*
Grade	1	2	1	2	1	2	
Fingers Used	13	5	16	2	13	5	1.92*

** χ^2, df = 2, $\geq$ 9.21, $p \leq 0.01$
* Not significant

REFERENCES

Ayres, A.J. (1972) The Southern California Motor Accuracy Test. (Los Angeles, Western Psychological Services).

Birch, H.G. & Lefford, A. (1967) Visual Differentiation, Intersensory Integration and Voluntary Motor Control, Child Development Monograph Services, 32, No.110.

Bull, R. & Stevens, J. (1979) The Effects of Attractiveness of Writer and Penmanship on Essay Grades, Journal of Occupational Psychology, 52, pp.53-59.

Callewaert, H. (1963) For Easy and Legible Handwriting, In Herrick, V.E. (Ed) New Horizons for Research in Handwriting (Wisconsin, University of Wisconsin Press).

Cavanah, L. & Myers, A. (1937) Handwriting for Expression (New York, American Book Company).

Coles, R.E. & Goodman, Y. (1980) Do we really need those oversized pencils to write with?, Theory Into Practice, 19, 3, pp.194-196.

Edigar, M. (1979) Good handwriting a must for students in our schools, Reading Improvement, 16, 2, 112-113.

Hill, H.H. & Savage, J.A. (1938) Handwriting Made Easy (Dallas Texas, The University Publishing Company).

Krzesni, J.S. (1971) Effect of Different Writing Tools and Paper on Performance of the Third Grade, Elementary English, 47, 11.

Miller, J.R. (1924) Penmanship Teaching and Supervision (Los Angeles).

Rosenbloom, L. & Horton, M.E. (1971) The Maturation of Fine Prehension in Young Children, Child Neurology and Developmental Medicine, 13, pp.3-8.

Tawney, S. (1967) An analysis of the ball point pen versus the pencil as a beginning handwriting instrument, Elementary English, 41, 1.

Wiles, M.E. (1940) The Effect of Different Sizes of Tools upon the Handwriting of Beginners. (Unpublished doctoral dissertation, Harvard University).

Ziviani, J. (1981) Children's prehension while writing - a pilot investigation. Accepted by the British Journal of Occupational Therapy, September 1981.